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PHASE II

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13. ABSTRACT (Maximum 200 words)

THE OBJECTIVE OF THIS REPORT IS TO OUTLINE A PLAN FOR MONITORING GROUND WATER, SOIL, AND VEGETATION IN THE VICINITY OF THE HYDRAZINE BLENDING AND STORAGE FACILITY (HBSF). ANALYTES OF INTEREST ARE HYDRAZINE, UDMH, NDMA, AND THEIR DEGRADATION PRODUCTS.

INFORMATION INCLUDES:

1. NUMBER AND LOCATION OF WELLS TO BE DRILLED AND SAMPLED
2. NUMBER AND LOCATION OF SOIL SAMPLES
3. NUMBER OF VEGETATION SAMPLES
4. METHODS OF ANALYZING GROUND WATER, SOIL, AND VEGETATION.

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ROCKY MOUNTAIN ARSENAL
MONITORING PLAN
FOR
HYDRAZINE BLENDING FACILITY
PHASE II

1984

1. OBJECTIVES. To acquire and evaluate data on which to base an adequate environmental monitoring and cleanup program in and around the hydrazine facility. To determine the areal extent of soil, vegetation, air and water contamination. To determine the concentrations of the primary contaminants and secondary contaminants produced by degradation of the primary contaminants.

2. SAMPLING. Samples are to be taken at sites of probable high contamination based on historical and operational considerations and results of the complete soil gas survey. Soil gas will be sampled at 51 additional locations in and around the hydrazine facility (Figure 1) and at 20 locations in the hydrazine railroad storage yard north of the main facility (Figure 2). Data obtained will be used to complete the areal distribution map (Figure 3) of nitrogenous compounds.

Although water sampling in the hydrazine facility area has been sporadic there are indications of increases of several hundred percent in the concentrations of some inorganic parameters in the groundwater passing under the facility (Table 1). The data used in Table 1 is not all from the same sampling period but is the most recent data available. The locations of the wells used in Table 1 are shown in Figure 4.

a. GROUNDWATER. Six wells will be drilled around the hydrazine facility with approximate locations as shown in Figure 5. Contractor personnel, with an RMA Contracting Office Representative (COR) from the Environmental Division will conduct the drilling. Water samples will be collected by either the contractor or RMA Contamination Migration Branch (CMB). Fifteen wells (Figure 6) including six new wells and nine existing wells will be sampled on a quarterly schedule. Wells will be sampled at the first aquifer (9 - 20 feet). Samples will be collected in a 360 degree arc around the facility.

b. SOILS. A total of 24 soil samples will be collected at four depths during the drilling of the six new wells. Twelve additional soil samples will be reserved to be taken at sites to be determined by the soil gas survey.

c. VEGETATION. Twenty vegetation samples will be collected in and around the hydrazine facility. Considering the analytes being sought, the collection of vegetation samples may be

dependent upon plant growth and weather and will be regulated by these factors.

3. ANALYSIS. All analysis will be performed by the Analytical Systems Branch (ASB).

a. GROUNDWATER. Samples will be appropriately preserved immediately after collection. Parameters to be analyzed for will be Hydrazine (H₂), Unsymmetrical dimethylhydrazine (UDMH), Nitroso dimethylamine (NDMA), Nitrates/Nitrites, Calcium (Ca), Chloride (Cl), Sodium (Na), Fluoride (F), Potassium (K), Sulfate (SO₄), and Conductivity (COND). The following general methods will be used. Lower detection limits (LDL) are estimates only at this time. Detection is to be by gas chromatography (GC) using a nitrogen/phosphorous flame ionization detector (N/P-FID). Sample clean-up steps will be used where appropriate

(1) Hydrazine and UDMH. Stable derivatives are formed by addition of a derivatizing agent. The H₂ and UDMH derivatives are extracted with methylene chloride and concentrated. GC analysis is on a 10% OV-7 column. Expected LDL=1.0 ppm.

(2) NDMA. NDMA analysis is done by Federal Standard Method 607. Samples are extracted with methylene chloride, concentrated and exchanged into methanol. GC analysis is on Carbowax 20M/2% KOF. Expected LDL=20 ppm. A 10% SP-2250 column is used for verification.

b. SOILS. For hydrazine and UDMH soils will be extracted with water and stable derivatives will be formed and analyzed as in the water method above. For NDMA soils will be extracted with methylene chloride and analyzed as in the water method above.

c. VEGETATION. For hydrazine and UDMH vegetation samples will be homogenized with water and filtered. The filtrate will be treated to form stable derivatives and analyzed as in the water method above. For NDMA vegetation samples will be homogenized and extracted with methylene chloride and analyzed as in the water method above.

4. MANPOWER/COSTS. The following manpower and cost estimates apply:

Soil Gas samples - 71 @ \$55	\$ 3,905
Well Drilling - 6 ea (30 ft) @ \$600	\$ 3,600
CDR Supervision - 3 wells/day	16 hrs
Water sample collection - 15 ea @ 5/day (times 4)	96 hrs
Vegetation collection - 20 ea @ 6/day	27 hrs
Soil sample collection - 12 ea @ 4/day	24 hrs
116 Analysis - @ 9 hr/sample	1044 hrs

3 - 24 soil samples will be collected during well drilling and are included in the drilling cost.

22 - Includes sample management, analysis for hydrazine, UDMH and NDMA, quality control and data reporting. Also included is any air monitoring required during drilling or sample collection

Estimated total manpower 1207 hrs

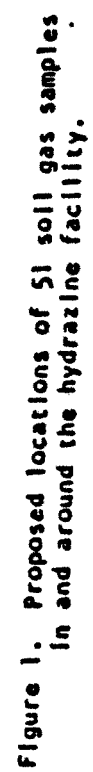
Estimated costs \$7,505

Current billing rate for Environmental Division direct labor is approximately \$19/hr. The overhead cost is \$45/hr. 1207 hrs @ \$64/hr=\$77,248

Estimated Total Cost \$84,753

Rounded cost \$85,000

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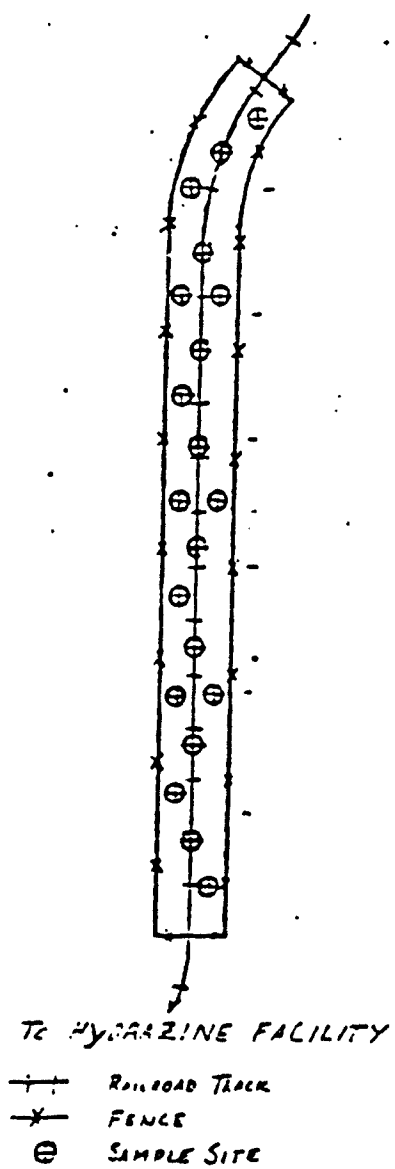


Figure 2. PROposed locations of 20 soil gas samples in the hydrazine railroad storage yard.

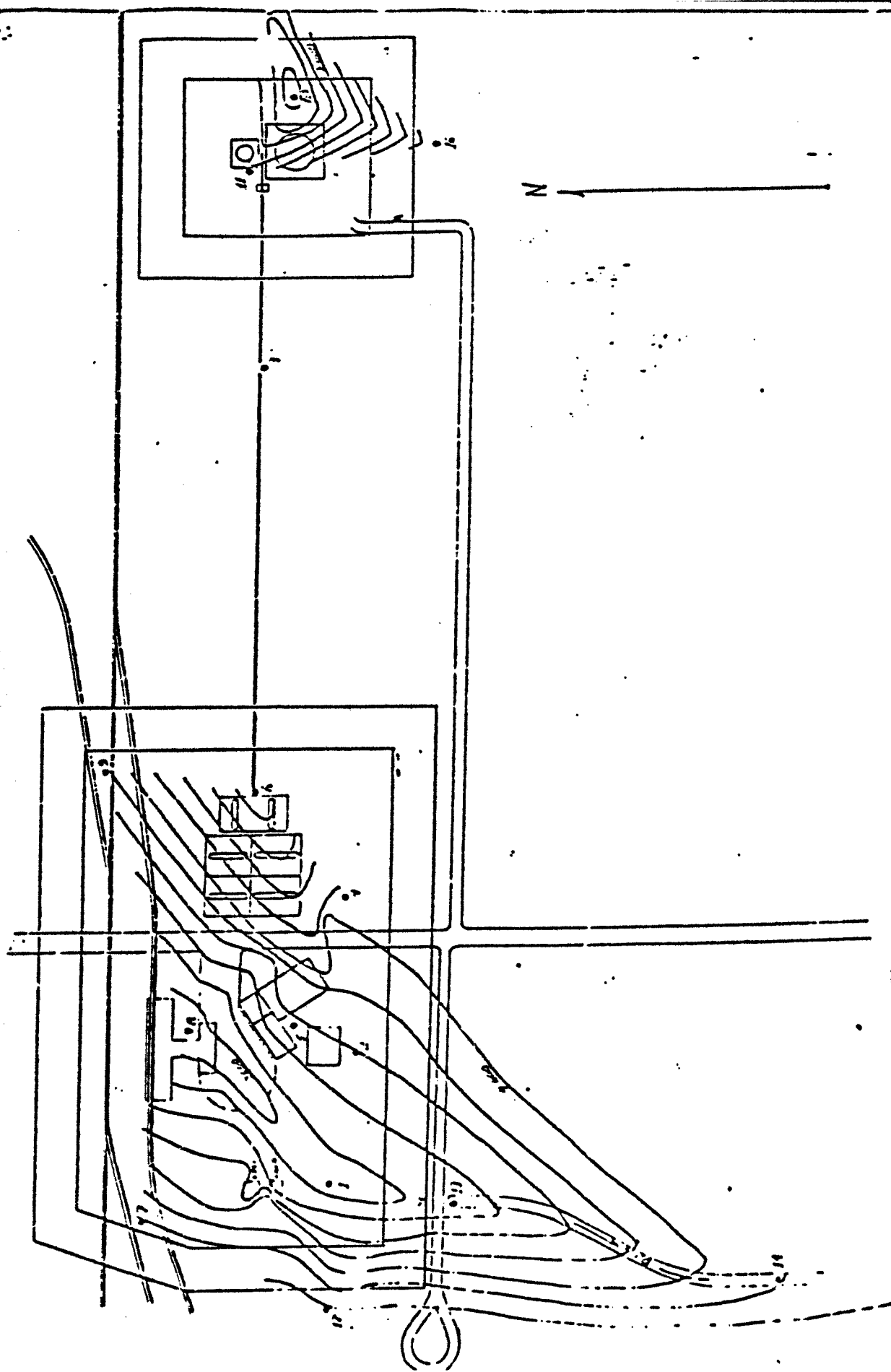


Figure 3. Concentrations of nitrogen containing compounds in soil gas in and around the hydrazine facility.

Table 1. Concentrations of inorganic parameters in ground water passing under the hydrazine facility.

Well No.	Sample Date	Ca	Cl	F	K	Mg	Na	NIT	SO ₄	HARD	COND UMHO
		- -	- -	- -	- -	mg/l	- -	- -	- -		
01-003	82204	32.0	22.0	3.0	3.8	10.0	79.0	0.5	55.0	89.0	570
01-008	84054	87.9	182	7.8	3.8	53.0	383	9.0	1090	382	2150
01-019	84054	43.1	90.3	2.3	3.3	14.0	209	16.0	222	153	1090
01-030	84054	66.7	86.1	2.7	3.0	32.0	186	5.1	209	228	1160
01-033	84054	56.0	51.0	.41	2.6	22.0	152	0.5	143	157	800
36-075	79051	ND	449	3.7	ND	ND	616	ND	ND	ND	ND
	83119	231	500	5.2	ND	99.6	ND	ND	ND	ND	ND

ND = Not Done

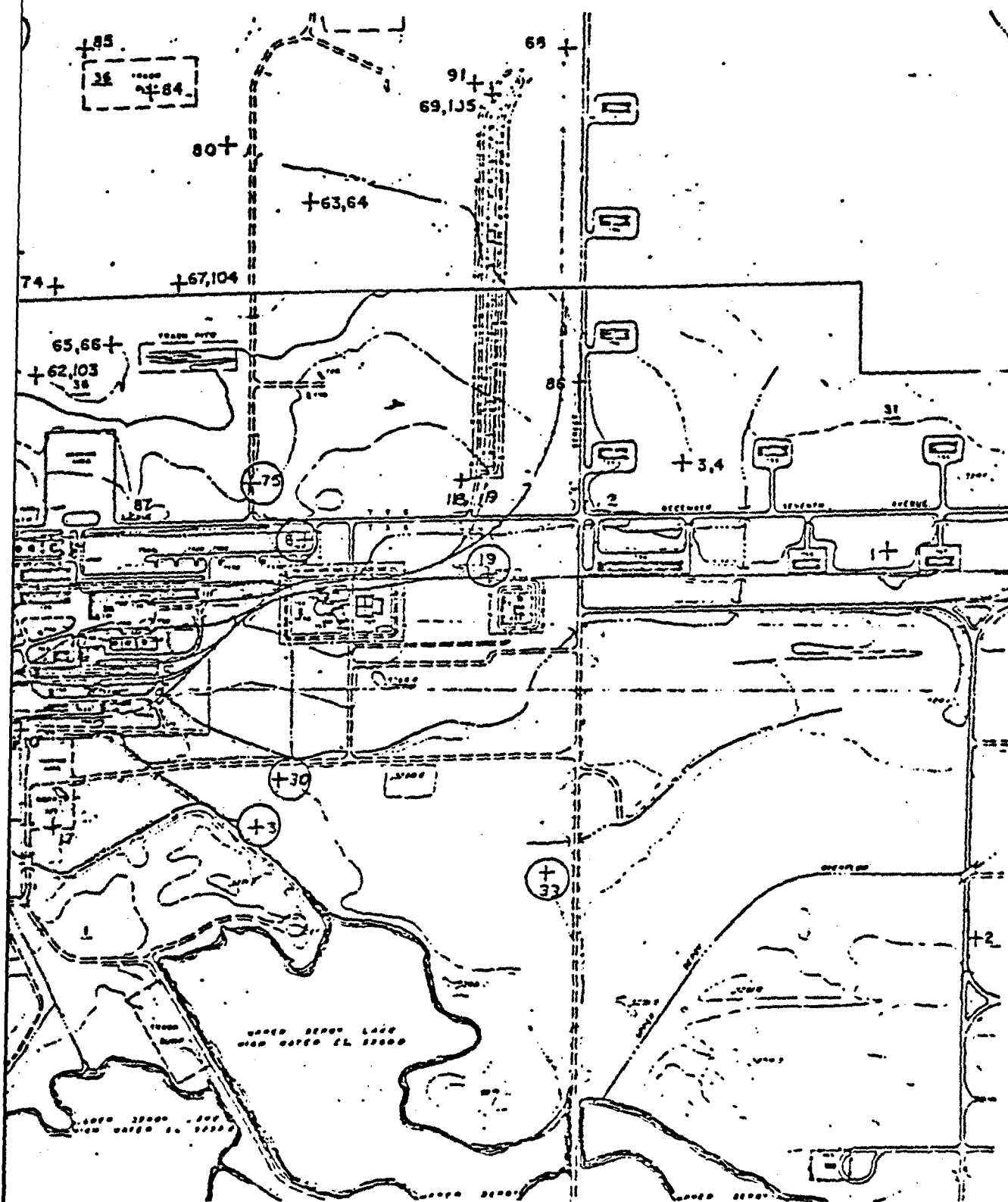


Figure 4. Locations of 6 wells used in Table 1 relative to the hydrazine facility.

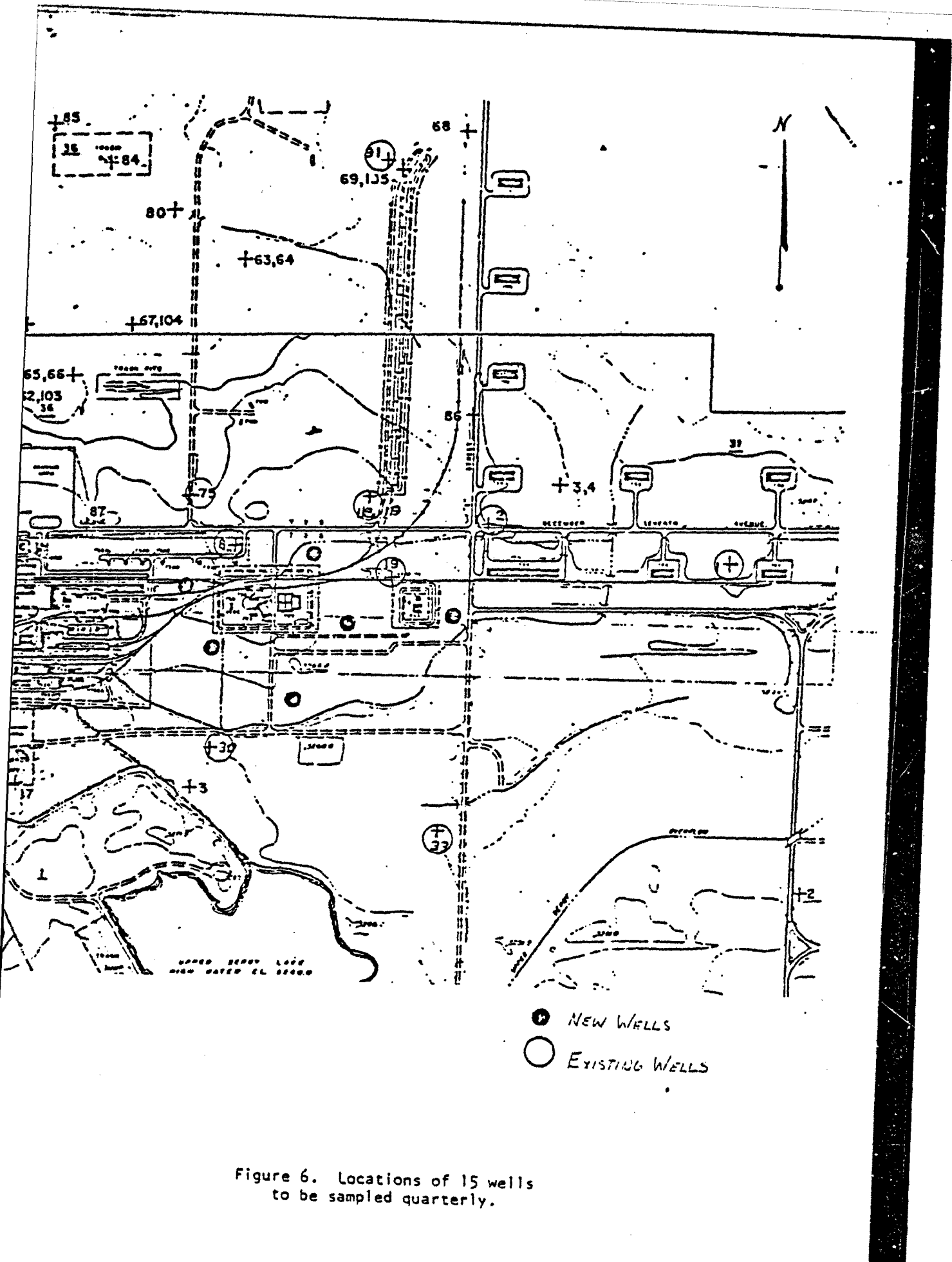


Figure 6. Locations of 15 wells to be sampled quarterly.